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DISTINGUISHED SPEAKER SERIES

Leveraging Low Temperature Plasmas for Materials, Energy and Environment

One vision of the future is that processes that fuel society will be carbon neutral and our power needs will be met by renewable green electricity. Societies, however, run on chemical reactivity, and so processors are needed to convert green electricity to chemical reactivity. Low temperature plasmas (LTPs), partially ionized gases, can and do serve in this role. LTPs are processors that use electricity to generate chemically reactive environments in gases, liquids and on surfaces. The challenge is how to make these conversion processes more efficient and less costly. One strategy is to use atmospheric pressure plasmas to selectively produce chemical reactivity in multiple phases. In this talk, advances in the science and technology of atmospheric pressure plasmas (APPs) will be discussed. Using results from computational investigations, the challenges and potential applications of using APPs for chemical conversion, treatment of liquids (from water to biological fluids), environmental cleanup and plasma medicine will be described. For example, plasma catalysis is a process in which plasma production of radicals at low temperatures is combined with conventional catalysis to improve the efficiency and selectivity of chemical conversion. Plasma catalysis entails APPs propagating through a bed of metal catalyst impregnated dielectric matrices. How might APPs be configured to optimize these interactions for higher chemical conversion efficiency? At the other extreme of potential applications is APP treatment of liquid aerosols. This process is a new means of customizing the plasma induced reactivity of liquids, with opportunities for new applications in agriculture and food safety.

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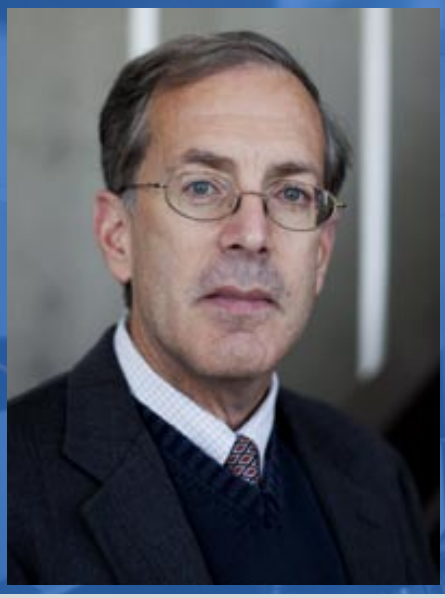

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Mark J. Kushner received the BS and BA from the University of California-Los Angeles, and the MS and Ph.D. in Applied Physics from the California Institute of Technology. He served on the technical staffs of Sandia National Laboratory, Lawrence Livermore National Laboratory and Spectra Technology before joining the University of Illinois in 1986 where he was the Founder Professor of Engineering and served in several administrative roles. In January 2005, Dr. Kushner joined Iowa State University as Dean of Engineering where he established the Engineering Policy and Leadership Institute. Prof. Kushner joined the University of Michigan as founding director of the Michigan Institute for Plasma Science and Engineering and George I. Haddad Collegiate Professor in September 2008. Prof. Kushner's research area is the fundamentals and applications of low temperature plasmas on which he has extensively published. His research group has developed several suites of computer models for low temperature plasmas, plasma chemistry and plasma surface interactions which are widely used in universities and industry. Prof. Kushner is a Fellow of several societies and has received several awards including the APS Allis Prize. He is a member of the US National Academy of Engineering. Prof. Kushner most recently co-chaired the National Academies Decadal Study on Plasma Science.